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eAutomation

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UNO Application Stories

Solutions from the Field

- Facility Management
- Environmental Monitoring
- Machine Automation
- Building Automation
- Intelligent Transportation

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Embedded Automation Computers

Introduction

Advantech's Embedded Automation Computers are designed to fulfill the needs of mission-critical automation applications. Their embedded design, rugged features and powerful computing technology deliver reliability and flexibility. These computers are targeted to satisfy customers looking for a robust and compact computing platform with an industrial design and built-in I/O to handle diverse automation applications.

The UNO series takes advantage of field-proven and real-time operating systems that are used worldwide, such as Microsoft Windows CE .NET, and Windows XP Embedded. These operating systems are combined with several standard networking interfaces, including; Ethernet, wireless networking, RS-232/422/485, onboard I/O interfaces, PC Cards, and much more. Because of their open architectures, great expansion capabilities and reliable fanless and diskless design, Advantech's UNO series are ideal platforms for implementing custom industrial applications, such as SoftLogic controllers, communication gateways, data loggers, facility monitoring systems, device management, and Fieldbus network control systems.

Industrial-Grade Designs for Harsh Environments

The UNO series are highly rugged and robust, making them suitable for critical and harsh environments. UNO's special cooling system design eliminates the weakness of traditional PC's by eliminating fans and moving parts. They are also designed with a strong mechanical design that has excellent shock and vibration resistance. They can endure high operating temperatures, and almost anything an industrial environment can demand.

Open-System Architecture Designed for Automation

The UNO series has an open-system architecture, which provides the most popular interfaces, such as RS-232/422/485 serial communication ports, Ethernet ports, USB ports, CompactFlash, PC/104 slots, PCI slots, PC Card extension slots, and VGA for display panels. With rich interface support, the UNO series can connect to diverse devices and equipment for better automation control.

An Embedded OS for Rapid Application Development

UNO provides an embedded operating system that offers a pre-configured image with optimized onboard device drivers. Users can choose between three of the most popular embedded operating systems: Microsoft Windows CE .NET, Microsoft Windows XP Embedded, and Embedded Linux. These embedded operating systems fulfill the toughest requirements for complete functionality and high reliability. You will quickly discover how the UNO series proves to be an application-ready platform that saves time and energy, which is crucial when launching a new project.

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UNO Series Selection Guide

Model Name	UNO-1019	UNO-2050E	UNO-2052E	UNO-2053E	UNO-2059E
CPU	XScale PXA 255 200 MHz	GX2-400 MHz	GX2-400 MHz	GX2-400 MHz	GX2-400 MHz
Onboard RAM	64 MB SDRAM	256 MB DDR SDRAM	256 MB DDR SDRAM	256 MB DDR SDRAM	256 MB DDR SDRAM
Battery-Backup RAM	-	-	-	-	-
VGA/Mouse/Keyboard	-	Yes	Yes	Yes	Yes
Audio	-	-	-	Yes	-
Serial Ports	2 x RS-232 2 x RS-232/422/485	2 x RS-232 2 x Isolated RS-232/422/485	2 x CAN 1 x RS-232	2 x RS-232	2 x RS-232 2 x RS-232/422/485
Ethernet Ports	2 x 10/100Base-T	2 x 10/100Base-T	1 x 10/100Base-T	2 x 10/100Base-T	1 x 10/100Base-T
USB Ports	-	-	One	Two	Two
PC Card Slots	-	-	-	One	One
Printer Ports	-	-	-	-	-
PC/104 Expansion	-	-	-	-	-
PCI Expansion	-	-	-	-	-
Onboard I/O	2-ch DI/O	8-ch Isolated DI/O	4-ch Isolated DI/O 2-ch isolated AI	-	-
Watchdog Timer	Yes	Yes	Yes	Yes	Yes
CompactFlash Slots	One External	One internal	One internal	One internal	One internal
2.5" HDD Expansion	-	Optional	Optional	Optional	Optional
Operating Systems	Windows CE .NET 4.2	Windows XP Embedded, Windows CE 5.0, Windows 2000/XP, Linux			

Ordering Information

UNO-1019ACE-A1E	PXA 200 MHz UNO w/ 64 MB RAM, w/2 x LAN, 4 x COM, CF Card, Windows CE.NET 4.2
UNO-2050E-IDA0E	GX2-400 MHz UNO w/ 256 MB RAM, 2 x LAN,4 x COM, 16 DI/O
UNO-2052E-IDA0E	GX2-400 MHz UNO w/ 256 MB RAM, 2 x CAN, LAN, 8 DI/O
UNO-2053E-IDA0E	GX2-400 MHz UNO w/ 256 MB RAM, 2 x LAN, 2 COM, Audio
UNO-2059E-IDA0E	GX2-400 MHz UNO w/ 256 MB RAM, PC Card, 3 COM, LAN

Model Name	UNO-2170	UNO-2171	UNO-3072L	UNO-3072	UNO-3074
CPU	Celeron M 1 GHz	Celeron M 1.0 GHz, Pentium M 1.4	Celeron M 1.0 GHz	Celeron M 1.0 GHz, Pentium M 1.4 GHz	Celeron M 1.0 GHz, Pentium M 1.4 GHz
Onboard RAM	512 MB DDR SDRAM	512 MB/1 GB DDR SDRAM	512 MB DDR SDRAM	512 MB DDR SDRAM	512 MB DDR SDRAM
Battery-Backup RAM	512 KB	512 KB	-	512 KB	512 KB
VGA/Mouse/Keyboard	Yes	Yes	Yes	Yes	Yes
Audio	-	Yes	-	-	-
Serial Ports	2 x RS-232 2 x RS-232/422/485	2 x RS-232, 2 x RS-232/422/485 with DB9 connectors	2 x RS-232, 2 x RS-232/422/485	2 x RS-232, 2 x RS-232/422/485	2 x RS-232, 2 x RS-232/422/485
Ethernet Ports	2 x 10/100Base-T	2 x 10/100Base-T	2 x 10/100Base-T	2 x 10/100Base-T	2 x 10/100Base-T
USB Ports	Two	Two	Four	Four	Four
PC Card Slots	One	One	-	One	One
Printer Ports	One	-	-	-	-
PC/104 Expansion	PC/104	PC/104+	-	-	-
PCI Expansion	-	-	Two	Two	Four
Onboard I/O	-	-	4-ch isolated DI, 4-ch Isolated DO	4-ch isolated DI, 4-ch Isolated DO	4-ch isolated DI, 4-ch Isolated DO
Watchdog Timer	Yes	Yes	Yes	Yes	Yes
CompactFlash Slots	One internal	Two internal	One internal	One internal, One external	One internal, One external
2.5" HDD Expansion	Yes	Yes	Yes	Yes	Yes
Operating Systems	Windows XP Embedded, Windows CE 5.0, Windows 2000/XP, Linux				

Ordering Information

UNO-2170-C11E	Celeron M 1.0 G UNO w/512 MB RAM, w/2 x LAN, 4 x COM, PC/104
UNO-2171-C11E	Celeron M 1.0 G UNO w/512 MB RAM, w/2 x LAN, 4 x COM, PC/104+
UNO-2171-P11E	Pentium M 1.4 G UNO w/512 MB RAM, w/2 x LAN, 4 x COM, PC/104+
UNO-2171-P12E	Pentium M 1.4 G UNO w/1 GB RAM, w/2 x LAN, 4 x COM, PC/104+
UNO-3072-C11E	Celeron M 1.0 G UNO w/512 MB RAM, w/2 x PCI slot, 1 x PC card
UNO-3072-P11E	Pentium M 1.4 G UNO w/512 MB RAM, w/2 x PCI slot, 1 x PC card
UNO-3072L-C11E	Celeron M 1.0G UNO w/512MB RAM, w/ 2 x PCI
UNO-3074-C11E	Celeron M 1.0G UNO w/512 MB RAM, w/4 x PCI, 1 x PC card slot
UNO-3074-P11E	Pentium M 1.4G UNO w/512 MB RAM, w/4 x PCI, 1 x PC card slot

Airport Information Service System

Facility Management

Korea

Project Introduction:

An airport in Korea needed an industrial PC solution for their information center. The airport information center monitors and controls information in the airport at all times. The flight schedule has to be displayed all over the airport, security alarms need to be monitored and transferred to the information center, and parking lots need to be managed. The airport needed a compact and reliable controller that could be distributed in lobbies, information desks, and parking lots to announce flight information and monitor security alarms. Advantech's UNO-3072 proved to be a good choice.

System Requirements:

The customer required a controller that could monitor flight arrivals and departures, the airport security status and the parking lot, which led to the following requirements:

- Embedded operating system for simpler maintenance and increased reliability
- A compact fanless system that could fit into small control cabinets without giving temperature problems
- Sufficient processing power
- Good resolution for display panels

System Description:

The Information Service Center is responsible for monitoring the whole airport as well as delivering messages with the information service system, which is based on an Ethernet network. The flight schedule is broadcasted in real time from the Information Service Center to the local terminals. UNO-3072 allows insertion of one PCI video card to handle a security camera and one Fieldbus card to integrate 3rd party PLCs for equipment monitoring.

Moreover, the security and fire alarms are linked with UNO-3072's onboard I/O. UNO-3072 works as local terminals that are distributed in parking lots, lobbies, information desks, VIP rooms, and many other locations.

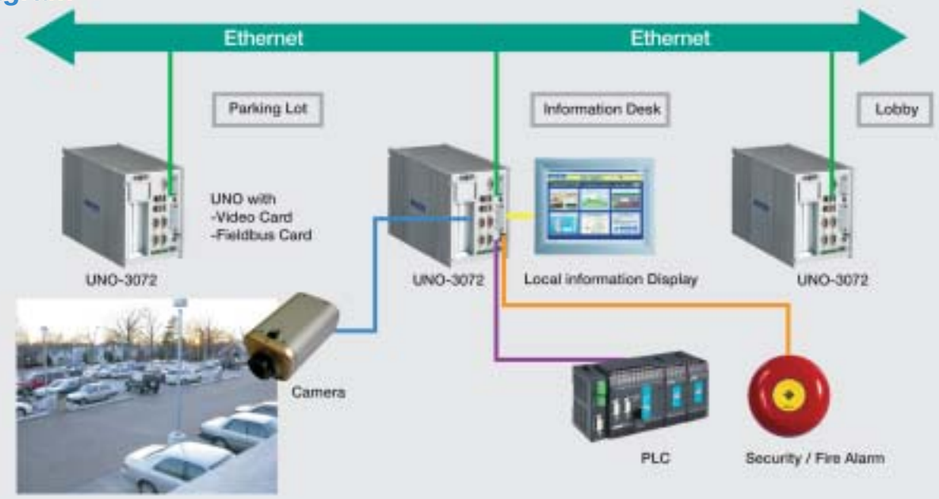
Project Implementation:

UNO-3072
Intel Pentium M Embedded Automation Computer w/ Two PCI Expansions

Conclusion:

Equipped with an Intel Celeron 1 GHz CPU, UNO-3072 is a powerful industrial-grade computer that could handle the multiple tasks required. Its fanless design provides reliability and high performance, while the compact and front-accessible design allows easy installation in lobbies, information desks, parking lots, and many more locations. The two PCI slots allow insertion of video cards, Fieldbus cards and other cards with high data transfer rates, while the four serial ports can take care of many serial devices.

System Diagram



Automated Passenger Clearance System

Facility Management

Hong Kong

Project Introduction:

To meet the challenges of ever-increasing passenger traffic through customs, more and more countries are choosing to employ the Automated Passenger Clearance System (APCS). In Hong Kong, the government decided to upgrade their existing system as well, dubbing their APCS the "E-Channel". With Advantech's UNO-2052E Embedded Automation Computer, all devices are integrated in an open architecture.

System Requirements:

More than 400,000 people pass through customs in Hong Kong everyday. At the Luohu checkpoint, each traveler is given about 1min to be identified. Since Hong Kong is one of the most popular tourist and business destinations in Asia, not to mention a major trading and transportation hub, Customs Officials must constantly review procedures and explore ways to allow passenger clearance to run more efficiently. Their latest effort is an APCS project called the “E-Channel”, which incorporates many new technologies such as; Biometrics, Smart Cards, Wireless Functionality, and Embedded PC’s. They hope this system can reach an 8-12 seconds per person processing time. Based on their requests, the system required the following specific parameters:

- Compact size
- USB port support for the fingerprint scanner
- CAN port support for special sensors
- COM port support for communication with the card readers
- LAN support for an Internet connection
- Economic price
- Stability and Reliability

System Description:

The UNO-2052E works as a central controller to integrate multiple devices. It is connected to a fingerprint scanner via USB, Smart Card readers through an RS-232, gateway access control, an LED indicator via CAN and DI/Os, and a Central Data Server through LAN.

The E-Channel’s processing system is simple; first people walk up to the card reader unit, and insert their Smart Identity Cards. The system will then connect to the Central Data Server to get identity approval through the Internet. While getting approval, it will notify the gate doors to open, and people can enter the E-Channel. After entering, people place their thumbs flat on the centre of scanner for fingerprint analysis. After verification, the gate doors will open and they can leave. Only one person is allowed to enter the E-Channel at a time. While one person is going through the fingerprint verification, the next person in queue may insert their Smart Identity Card into the reader. In the event of an error or accident, the system can send out a warning message to customs personnel through wireless communication.

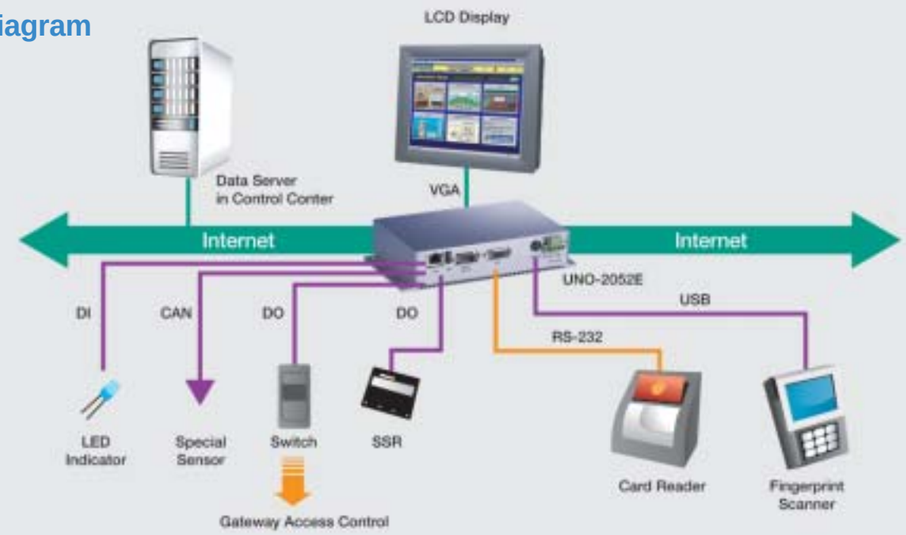
Project Implementation:

UNO-2052E
AMD-GX2 UNO with 2 x CAN, LAN, USB, RS-232, 8 x Isolated DI/O, 2 x AI

Conclusion:

UNO-2052E is the perfect controller for this complex system. Its compact size can fit into the limited space, and fanless design provides high reliability and stability for continuous operation. Compared to other PLCs, the UNO-2052E provides open architecture for easy integration with other devices and popular software such as Windows CE. Furthermore, it offers rich communication interfaces such as CAN, DI/O, serial port, and USB ports to easily connect to other devices. Advantech works closely with this customer to provide local technical support. Now, the process time through Hong Kong customs has been shortened to 8-12 seconds per person, providing our customer and travelers alike with more efficient and speedy processing.

System Diagram



Wind Power Generation Monitoring System

Facility Management

Germany

Project Introduction:

Advantech's UNO-2160 has been successfully implemented in a 5,600 MW wind power generation system. It monitors the status of the generator and the communication with field PLC devices and Fieldbus equipment. Combined with customer applications, UNO-2160 is a compact, complete, and high-performance system.

System Requirements:

Wind power generation systems are always installed in very harsh environments with dust and wind. Under these circumstances, applying a PC with a fan as the host platform will result in fan problems and system crashes. The customer aimed to design a reliable power generation monitoring system. But, they also needed a compact platform that could be easily installed and replace the PC system used before.

System Description:

UNO-2160 works as a remote monitoring system that controls and checks functions of the turbine, and stores information in a small database. In the first phase, the system was installed with Windows 2000, which required a high performance CPU and HDD. In the second phase, the customer switched the operating system to XP Embedded with industrial CompactFlash to increase system reliability.

UNO-2160 integrates 3rd party PLCs and Fieldbus devices through its PC/104 expansion interfaces. Thus UNO-2160 can take care of the complete wind power generation system, and provide feedback to the power management center through an Ethernet network.

Project Implementation:

UNO-2160
Celeron 400 MHz Embedded Automation Computer with PC/104 Expansion

Conclusion:

The wind power generation monitoring system is a dedicated application based on Windows 2000/XP. It needed a high-performance platform rather than a general platform for Windows CE. Equipped with an Intel Celeron 400 MHz CPU and 256/512 SDRAM, UNO-2160 is a powerful model that can handle Windows 2000/XP operating systems.

In addition to monitoring the generator's working status, many devices had to be integrated with this wind power generation monitoring system. The UNO-2160 provided abundant interfaces for the network integration. The customer may link the UNO-2160 with a PLC system via its Ethernet interface. Furthermore, the PC/104 expansion interface can be equipped with a Fieldbus Card to communicate with field equipment.

System Diagram

Improving Reliability of Monitoring Systems in the Iron and Steel Industry

Facility Management

China

Project Introduction:

Most iron and steel processors have already implemented monitoring systems that use traditional PCs or controllers for data samplings. But traditional PCs have often had problems with the rough operating environment of steel and iron mills. A customer in China wanted to create a more reliable, but also efficient monitoring system to replace their old system. UNO-2050E proved to be the right solution after matching all the critical requirements.

System Requirements:

The main challenge with monitoring systems in iron and steel mills is the large volume of sample data, and the extreme environment. Traditional PCs often become unstable in these conditions, and these older systems can rarely be trusted to provide reliable monitoring data. The customer therefore wanted to create a new system based on an industrial PC that could withstand tougher environments, and at the same time provide good computing performance.

System Description:

With the implementation of UNO-2050E in an iron and steel manufacturing system, all the pump station data can be sampled through an Ethernet network using Modbus/TCP communication. The PLC monitoring control for manufacturing processes can also be connected to UNO-2050E through an RS-485 network. Local storage is done by a vibration-resistant CompactFlash card, while the monitoring data is simply collected and transferred to a secured SQL server for storage. Through the factory intranet, management can monitor, control and search for specific data.

A set of control buttons is connected to the 4-channel digital I/O interface of UNO-2050E, so if the system detects an alert, operators can quickly deal with the situation via the control keypad.

Project Implementation:

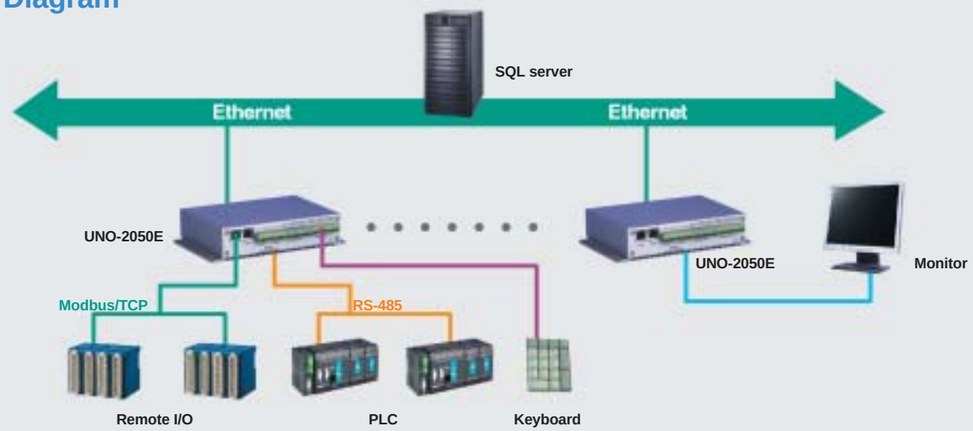
UNO-2050E
AMD-GX2 UNO with 2xLAN,
2xRS-232, 2xIsolated RS-232/422/485,
16xIsolated DI/O

Conclusion:

UNO-2050E is in this project primarily used as a highly stable and functional embedded platform. UNO-2050E not only has the same capabilities and flexibilities of a traditional PC, but it also overcame the three biggest problems of computer system in this industrial environment. First of all, an unreliable fan system can fry the internal circuit, causing downtime that hurts productivity. Second, the spindle of a HDD can not work properly in vibrating environments. Lastly, the flow of power will create an enormous amount of heat. UNO-2050E's fanless, anti-shock and anti-vibration design is the perfect solution for such a hostile environment.

Equipped with two LAN ports, UNO-2050E not only collects sampling data using Modbus/TCP, but also transfers this data to the server through the Intranet. So it works like an intelligent device between two networks. Installed on the CompactFlash card is the embedded version of Windows CE .NET, which has built in SQL components so that management can search through the database remotely. To simplify the operator's usage, a set of simple control keys are connected to 2050E's 4-channel digital I/O for simple control commands.

System Diagram



Warehouse Crane Control System in the Metal Industry

Facility Management

Taiwan

Project Introduction:

A customer was using manual crane operation to move the steel inventory in their warehouse, which required additional employees on the floor to communicate with the crane operator. This was causing a lot of problems, including; shipment delays, inefficiency, and increased safety risks. By incorporating Advantech's UNO-2170, FPM-2150, and ADAM-4052 modules, the system was upgraded to a semi-automated system with reliable operation, improved efficiency, and reduced risks to employees.

System Requirements:

The customer was using an out-of-date method for inventory control in their warehouse. First, the staff would get the shipment notice from sales, and then inform the crane operator which products to get from the warehouse via wireless intercom. It usually took a lot of time for this series of communications, and many employees were needed on the warehouse floor to help direct the crane operator, all of whom were at safety risk. The customer wanted to improve the efficiency of the crane control system and increase the workers' safety.

System Description:

When trucks arrive at the warehouse, all information is updated through the RFID reader, which can also notify the management office in real-time. Then management office can then get the materials request and send it to the UNO unit in the crane car. From the FPM-2150 monitor, the operator will find the exact location of the materials through the two ADAM-4052 modules; one for the X-axis and the other for the Y-axis. Operators can easily execute the pick & place tasks with this efficient, fast-delivery system.

Project Implementation:

UNO-2170
Celeron M 1GHz Embedded Automation Computer with PC/104 Expansion

FPM-2150
Industrial 15" Flat Panel Monitor with Direct-VGA Port

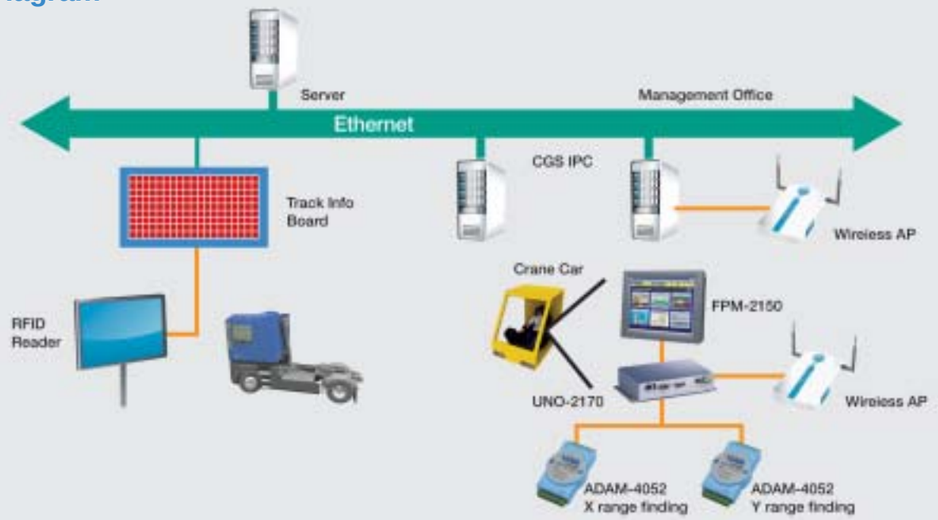
ADAM-4052
8-ch Isolated Digital Input Module

Conclusion:

Crane operation is a rugged and high-vibration machinery process, which makes the UNO-2170 the perfect anti-vibration control mechanism to be installed in the crane. Its compact size is the perfect fit for limited space and its fanless design provides reliable operation. Additionally, FPM-2150 is a lightweight monitor and can easily be installed in the crane. Combining the FPM-2150 and UNO-2170, provided the perfect solution to upgrade the crane control system. Furthermore, because the monitor and the computing system are separate, future maintenance on the units can be completed much easier.

It usually took about 20 minutes to get the materials from the warehouse to truck. After installing this new system, the process is shortened to 10 minutes. Also, it used to require alot of employees to be on the warehouse floor to help manage the material movement. The new semi-automated system reduces labor costs as well reducing risks to the on-site employees.

System Diagram



Security Monitoring System in Telecommunications Switching Facilities

Facility Management

USA

Project Introduction:

A major North-American telecommunications company needed to build a reliable security monitoring system that could integrate all their required functions in one hardware platform. UNO-2059E hardware is now being installed as the server for communications and data processing functions in many of the company's nearly 40,000 facilities located throughout the United States.

System Requirements:

The customer required a stable, affordable hardware platform to run a Linux operating system, communicate on an RS-485 network to field devices, and offer multiple options for system-to-system communications. These options included Ethernet and modem connectivity as well as USB port connections, and external HDD capability. All of this capability had to be packaged in a device with a small form factor, and sold at a very competitive price.

System Description:

Security software was loaded onto UNO-2059E, which serves in each location as the central processor and main communication hub. All devices are connected to UNO-2059E with RS-485 wiring. As a data gateway, UNO-2059E receives data by modem communication and passes it to the data server if necessary. If a single point of failure occurs, the damaged equipment is simply replaced, and it won't affect other systems.

Project Implementation:

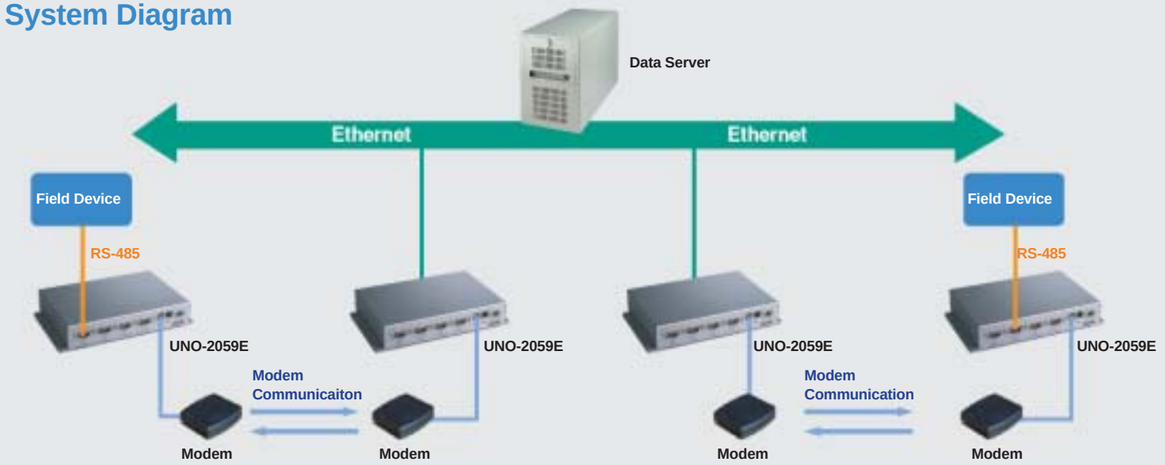
UNO-2059E
AMD GX2 UNO with PC Card, LAN, 2xUSB, 2xRS-232/485, 2xRS-232/422/485

3rd Party Security Software

Conclusion:

After testing several UNO devices in the laboratory and in the field, the customer selected UNO-2059E. All related security software is easily packaged on one hardware platform, instead of several. UNO-2059E serves in each location as not only the central processor, but also as a communication hub. If a failure occurs at any single point, only one system needs to be replaced. This new facility monitoring system decreases the possibility of the whole system failing, and reduces maintenance costs at the same time. This was very important for this large, nationwide project. So far, over 200 systems have been installed, and many more are being awarded each month. The total potential is almost 40,000.

System Diagram



Facility Management System

Vending Machines in Tokyo, Japan

Japan

Project Introduction:

Since the 1880's when the first vending machines were introduced to dispense postcards, demand for these convenient product sales devices has increased rapidly. Vending machines have undergone drastic changes over the years, and just as with all devices in our society, are becoming smaller and more high-tech. The latest vending machines, for example, require CPU's and Ethernet ports, and at the same time they are being designed smaller to save space. With these requirements in mind, Advantech's UNO-1019 embedded platform is the perfect solution to be installed at the core of these units.

System Requirements:

Vending machines have become small retail shops, and worldwide demand on these machines has increased rapidly. Recently, vending machines have begun to be developed with proprietary controllers, but due to the fact that many devices have different specifications and protocols, it's very difficult to integrate all of them into the same controller. Usually, manufacturers need to pay huge expenses for modifications or revisions to integrate all the required devices into one controller.

Our customer was seeking a controller with a PC-based open architecture which was easy to develop for, and easy to maintain. When they came to us, the choice was obvious; the UNO-1019 was the perfect solution. Aside from its open architecture, easy development structure and easy-to-maintain design, the UNO-1019 provides a compact form factor to save space in the tight vending machine architecture, allowing more space for product storage.

System Description:

The coin validator, beverage dispenser and electronic bulletin board are connected to UNO-1019's serial (RS-232) communication ports. The ADAM-4051 and ADAM-4055 are connected to COM4 of UNO-1019 in serial RS-485 mode. Moreover, one Ethernet port is connected to PHS SMS system, and the other is connected to the manufacturer's server, providing consumers with two different ways to order products. The first is the traditional method, and this is when consumers put physical money into the machine, the coin validator checks the amount, and the electronic bulletin board displays this amount onscreen, giving the clear information for purchasing. Once the amount has been verified, the UNO-1019 will drive ADAM-4051 and ADAM-4055 modules to output the selected product. The new way to purchase products is via mobile phone. First, the consumer will send out a predefined SMS, then the PHS SMS system will verify it and then link to the manufacturers system, then the server will inform the UNO-1019 to complete this transaction, and drive the dispenser to output the selected product. In this method, the fee will be charged on the customer's mobile phone bill.

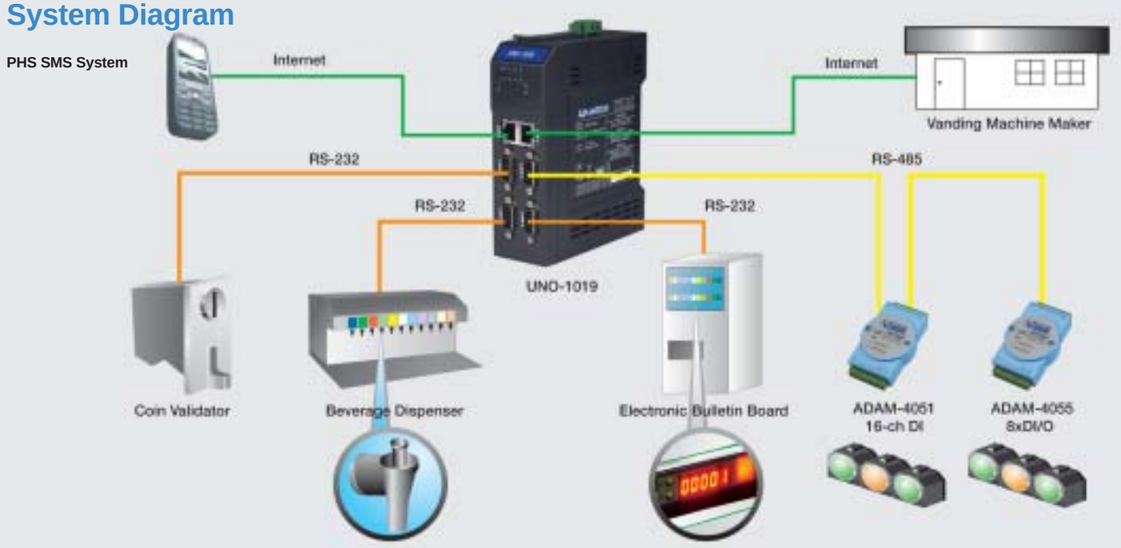
Project Implementation:

UNO-1019
Industrial DIN-rail Embedded Automation Computer with 2xLAN, 4xCOM

Conclusion:

Advantech's UNO-1019 is RISC-grade embedded platform that offers 2 LANs, 4 serial ports, and 4 digital inputs & outputs to fulfill I/O device expansion. Also, the UNO-1019 provides a CompactFlash for data storage, and its compact size saves installation space, allowing more room for other devices. By using a low power consumption CPU, CompactFlash card and Microsoft XP Embedded SP2, the UNO-1019 is a highly reliable embedded fanless controller that provides stability and performance. By adopting the UNO-1019, our customer has shortened manufacturing time, saved on development costs, and is able to leverage a PC-based open architecture into all of their new units, allowing all the serial device protocols to be easily implemented.

System Diagram



Mobile Environmental Monitoring System

Environmental Monitoring

China

Project Introduction:

After years of tremendous growth, Shanghai's air quality has deteriorated. To monitor the situation, there were fixed air quality measurement stations around the city, but these proved to give different readings depending on nearby traffic conditions. The solution was to create a mobile environment monitoring system using Advantech's UNO-2050E. With a compact design and reliable operation in vehicles, UNO-2050E could take on this special environmental monitoring challenge.

System Requirements:

A standard measurement station consisted of an ombrometer to measure rainfall, and analysis equipment for SO2, NOx, CO, O3 and PM10. The mobile measurement station would need to send data back to a central monitoring station together with positioning data based on GPS readings. With installation in a minivan, the system had to be very compact and rugged enough to withstand vibration when the vehicle was driving.

System Description:

The monitoring system works like a remote data acquisition system, with a wide range of analysis equipment together with GPRS connectivity, a GPS, and UNO-2050E as the system controller.
With its two isolated RS-485 ports, UNO-2050E connects to two ADAM-4017 analog input modules to retrieve monitoring data from the measuring equipment, while UNO-2050E digital I/O channels are used to connect directly with the ombrometer to measure rainfall.

GPS is used to communicate with a satellite and get the position of the vehicle. UNO-2050E connects to this GPS by one of its RS-232 serial ports, and the other RS-232 serial port connects to a GPRS to transmit the measurement and position data back to the central monitoring station. UNO-2050E runs Microsoft Windows CE .NET from a vibration-resistant CompactFlash disk.

Project Implementation:

UNO-2050E
AMD GX2 UNO with 2 x LAN,
2 x RS-232, 2 x Isolated
RS-232/422/485, 16 x Isolated DI/O

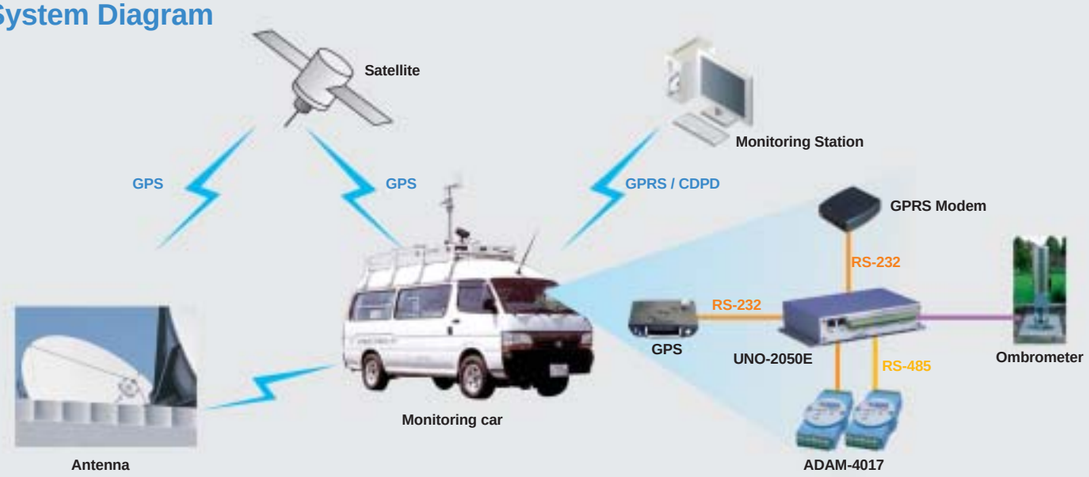
ADAM-4017
8-ch Analog Input Module

Conclusion:

Advantech provided a total solution for the mobile environment monitoring system to the customer. UNO-2050E with Embedded Windows CE .NET was a turnkey solution. Its fanless and compact mechanical design is perfectly suited for installation in a small vehicle, while its vibration- and shock-resistant design makes it more reliable and durable than common industrial PCs. The four required communication ports matched UNO-2050E's specifications, and combined with the ADAM-4017 analog input module, installing this system was quick and easy.

UNO-2050E satisfies most requirements for analysis equipment because it accepts standard 4-20 mA and 0-5 V signaling. Equipped with 8 digital input channels, and 8 digital output channels, UNO-2050E can directly connect to various counter-type analysis equipment for easier control and monitoring.

System Diagram



River Monitoring and Broadcasting System

Environmental Monitoring

Malaysia

Project Introduction:

Flooding is a major concern for many countries worldwide, especially in the rainy seasons and during typhoons and heavy storms. To address this issue, cities are continually rebuilding and reinforcing their river embankments. This work alone may not be enough to prevent damaging floods, and if the embankments do spill out, the citizens need to be warned. This is where technology and Advantech comes into the picture. Advantech's UNO-2053E with embedded Audio can help monitor and broadcast alarms in water level systems to warn engineers and citizens that their embankments have flooded over and threat danger is on the way.

System Requirements:

Flooding causes severe property damage, and is potentially fatal to residents that live in cities that experience heavy rainy seasons and typhoons. Although there is no way to prevent floods, in today's tech-driven world there are many ways that we can monitor and alert people to the event of oncoming water. The customer was looking to install a real-time water level information system to protect their citizen's lives and property. Advantech helped them to install the latest fanless box pc with embedded Audio functions, which can provide them with the rugged warning system they require. The customer was also looking a controller with an open architecture with easy development and maintenance attributes. Compared with an Analog Broadcasting system, this digital broadcasting system solves wiring and maintenance issues. Moreover in a traditional analog system, operators needed to stay at the station to deliver information all day long, even when the roads were closed and weather was severe. By leveraging digital technology with an open architecture controller, operators can remotely monitor water levels and leave the controller at the station to run automatically.

System Description:

This monitoring system includes an UNO-2053E, an ADAM-4017, and water level sensors. The ADAM-4017 is connected to the water level sensors to monitor level conditions in the river. The UNO-2053E acts as a consolidator, receiving, compiling, and sending all the information to the control center remotely. Once the water level reaches the high-level water mark limitation, the control center will trigger the UNO-2053E to broadcast a prerecorded warning message. Meanwhile, the control center can inform operators to close roads and warn nearby citizens. In this way, people can vacate these areas under bad weather conditions, saving lives and excessive property damage.

Project Implementation:

UNO-2053E
AMD-GX2 400 MHz Embedded Automation Computer with PC Card, 2xLAN, 2xUSB, 2xRS-232, Audio

Conclusion:

The UNO-2053E is a fanless Box PC which provides 2 x RS-232 serial ports, 2 x Ethernet ports and 2 x USB ports. By adopting a low power consuming CPU, a CompactFlash card and the Microsoft XP Embedded SP2 OS, it becomes a highly reliable and stabile embedded fanless Box PC. System integrators can reduce implementing time by leveraging a PC-based open architecture. The UNO-2053E provides a seamlessly integrated PC-based open architecture and built-in Audio functions, which can reduce cabling and wiring problems. Also the complete software solution (ADAM.Net) can reduce the implementing time. With Advantech's UNO-2053E and ADAM-4017, a simple and highly reliable monitoring system was achieved; all the warning messages can be previously saved to the UNO-2053E, and the remote control center only needs to trigger the selected message to broadcast. This feature also allows onsite visits to be reduced, saving labor costs. With the UNO-2053E installed in this solution, the city can save money, lives and property damage.

System Diagram

Active Camera Monitoring System at a Corporate Headquarters

Building Automation

USA

Project Introduction:

A large US Corporation had trouble managing its endless hours of digital video from three dozen cameras placed all throughout its facilities. They wanted to reduce the amount of video that was recorded to save disk space, and cut down on the time needed to review the videos. Advantech's UNO-3072L was found to be a reliable, simple, and cost-effective platform that could improve the efficiency and performance of their camera monitoring system.

System Requirements:

The old monitoring system was expensive and time-demanding to maintain, so the customer needed a reliable, simple, and cost-effective system that would allow connection to a central server and two-to-three cameras per location. Because of the demanding video signals, the transmission speed had to be fast, and the hard disk capacity had to be large. It was also necessary that the system could run Linux, since this was the standard operating system of the security system.

System Description:

UNO-3072L is connected to door keypads via its RS-232 ports, while its two PCI slots have PCI-bus capture cards that are connected to cameras. The keypad door entry system was already in place, but UNO-3072L connected the keypad with the cameras, so when the keypad was activated (which unlocks and opens the doors), a camera would be activated. When the door closed and the keypad deactivated, the door would relock (meaning the room was empty), and the cameras would turn off, stopping the video recording. So the system now only makes recordings when people use the door keypads.

Video clips are first stored on the HDD in UNO-3072L, and then transferred through the Ethernet network to a central server when required. The connection with the keypad has also enabled a new feature; each video clip is automatically labeled with the time and employee number.

Project Implementation:

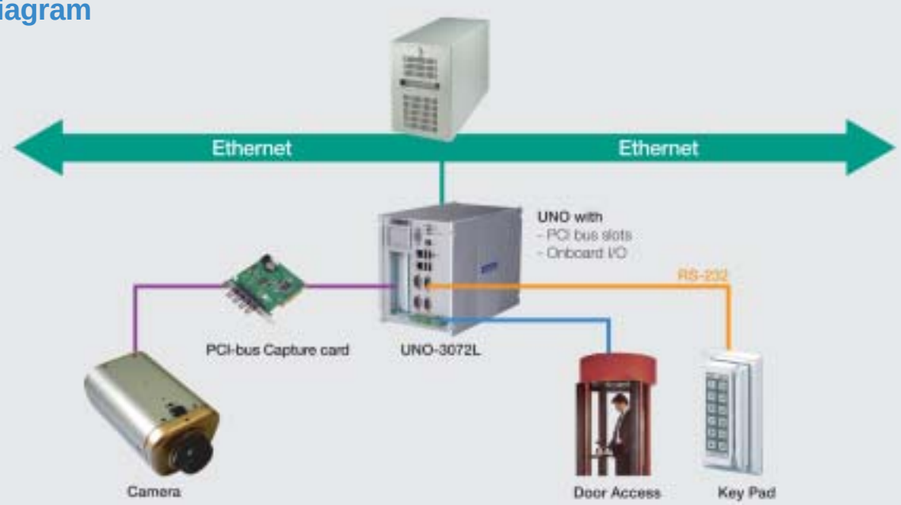
UNO-3072L
Celeron M Embedded
Automation Computer with Two
PCI Slots

Conclusion:

Equipped with two PCI-bus slots, UNO-3072L fulfilled the speed requirements to capture the video signals, while its 2.5" HDD extension offered large storage capacity for storing the video recordings. Designed in a fanless and compact chassis, UNO-3072L became a reliable and easy-to-maintain system for the security system. Compared to the old monitoring system, maintenance costs are drastically reduced. Besides, the complete system was at a price the customer was very pleased with.

The volume of video that is now stored is dramatically reduced. Only "action" is now captured, and hours of useless video clips are a thing of the past. Security has also improved with the new labeling system for video clips. The security system knows who entered what room - at what time.

System Diagram



Aluminum Manufacturer Rolls Out Thin Client Technology

Factory Automation

USA

Project Introduction:

One of the largest U.S. producers of rolled aluminum needed to update their aging Human Machine Interface (HMI) software without affecting production. The plant only shuts down one day each year, and all updates must be made without risking their world-class production and utilization numbers. Bundled with the customer's software, the UNO-2053E presented a compact and easily maintained thin client solution.

System Requirements:

Like many factories, the company was using PCs throughout to monitor and control production, but the management team was becoming tired of ongoing PC maintenance and system updates. The traditional PCs were equipped with rotary hard drives and fans, which meant higher costs for upgrades and maintenance. Whatever HMI they settled on, they wanted to a way to distribute the user interface without relying on the traditional distributed PC Model.

System Description:

Installed with ThinManager software in UNO's RAM, UNO-2053E becomes a thin client to retrieve data from the main server and simply display all information on screen. All communication between the thin clients (UNO-2053E) and the server is across a 100 Mbps fiber network. Everything is done from the server, with the thin clients acting as the HMI on the factory floor.

Project Implementation:

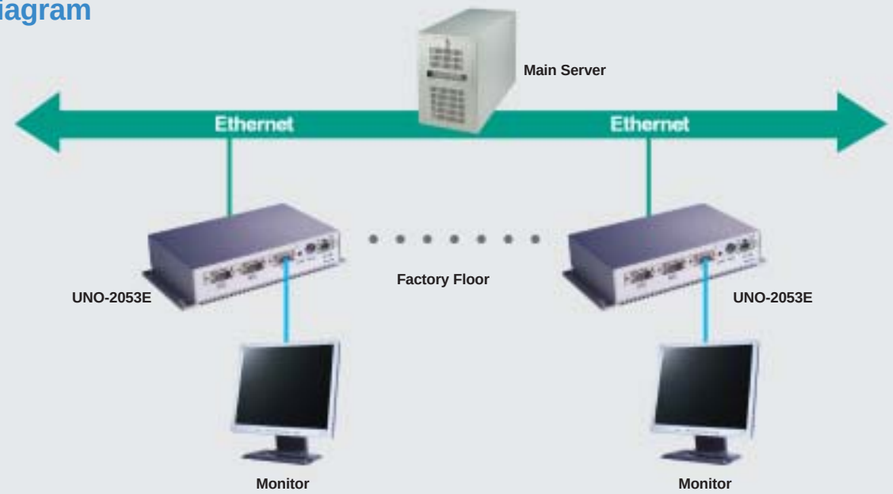
UNO-2053E
AMD-GX2 UNO with PC Card,
2xLAN, 2xUSB, 2xRS-232

Conclusion:

The customer had been reading up on Microsoft Terminal Server technology and realized it would allow them to replace their PCs with thin client terminals. The benefit that a Terminal Server System could bring to their installation was evident – any new software installed on a single server would be displayed on multiple thin clients. This would do away with the updates needed on individual PCs, thus eliminating the need for any downtime.

Compared to traditional PCs, UNO-2053E fanless and compact design reduces the risk of maintenance. UNO-2053E doesn't need a hard drive or operating system, just the ThinManager from ACP. With software downloaded to the UNO's RAM, it allows UNO-2053E to run as a thin client. UNO-2053E was used as a thin-client for faster upgrades, updates, and to make the system uniform.

System Diagram



Pay-off with Constant Tension

Machine Automation

China

Project Introduction:

Tram systems have been advancing each year by incorporating the latest innovative technologies. Recently, tram systems have been working provide steady and consistent tension on the cable, which allows them to increase speed and improve stability. To manage this technology, the pulley requires a PC to monitor and maintain constant tension while the pulley is in operation. Cable pulley systems are built into very space constrained housings, which makes them difficult to maintain and repair. Therefore, our customer needed a versatile and powerful industrial PC system which could be installed in a space limited area, which was easily accessible, and which could function in harsh environments. Advantech's UNO-3074 was the perfect choice, with its powerful CPU, versatile I/O interfaces, and its compact, fanless design. Moreover, Advantech's PCI cards feature plug & play functionality, which reduces maintenance time and costs over traditional ISA cards.

System Requirements:

In the past, the pay-off process was controlled by IPC's with an ISA card solution, which required a large chassis and manually set resources (Address, IRQ). The increasing demand for high-speed railway transportation has given way to new construction methods and standardized processes to maintain speed rate and consistent tension. Therefore, computing calculations, mechanization, programmed operations, and a real-time database are necessary. Furthermore, the customer was seeking a robust and compact-sized solution, since the environment is very harsh with extreme temperatures, and the space within the cable pulley system is limited.
Advantech provided the customer with the UNO-3074 with 4 x PCI cards to fulfill these strict requirements.

The UNO-3074 is a powerful and rugged fanless computer with rich I/O expansions. With compact dimensions (180x177x237 mm) and wide operating temperature range (-10~55° C), the UNO-3074 is an optimal choice for harsh and space-limited industrial applications.

System Description:

The UNO-3074 allows the insertion of 4 PCI cards to handle the sensors, actuators, switches or on/off buttons, and also motor encoders to integrate 3rd party equipment for monitoring.

There are 4 PCI cards installed in the system; with the PCI-1713 and PCI-1723 working as isolated AI and AO cards with closed-loop function for monitoring and providing constant cable tension for engineering. Moreover, the PCI-1753 works as DI/O function to control sensors and push buttons to ensure the system is on track. The PCI-1784 is an encoder, counter add-on card for PCI bus; and its flexible interrupt sources are suitable for motor control and position monitoring.

Project Implementation:

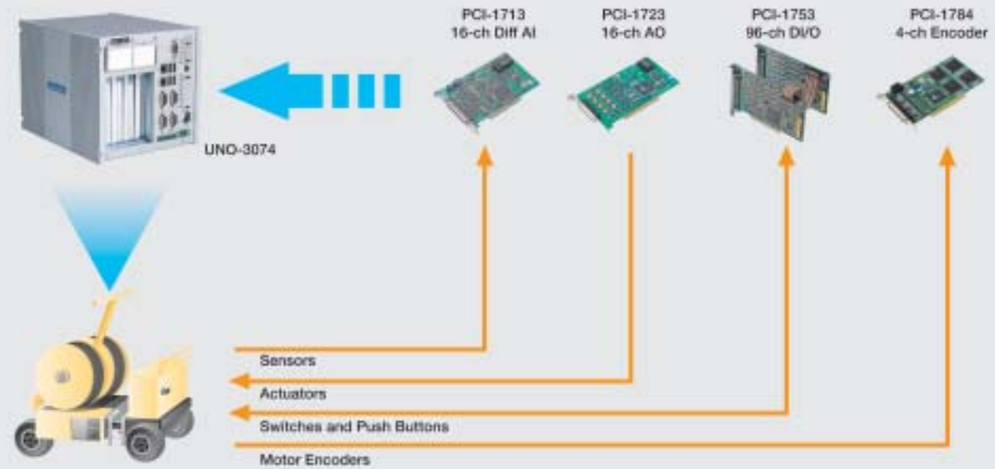
UNO-3074

UNO-3074 Pentium M 1.4 GHz Embedded Automation Computer with 4xPCI and 1xPC Card Slot
PCI-1713 100 kS/s, 12-bit, 32-ch Isolated Analog Input Card
PCI-1723 12-bit, 8-ch Isolated Analog Output Card
PCI-1753 96-bit Digital I/O Card
PCI-1784 4-axis Quadrature Encoder and Counter Card

Conclusion:

Advantech's UNO-3074 is an x86 platform that offers 4 x PCI card slots, 2 x LANs, 4 x serial ports, 4 x USB ports, a CompactFlash card, a PC card and a Pentium 1.4G CPU. System integrators can reduce implementing time by leveraging a PC-based open architecture. Also, the UNO-3074 provides a CompactFlash for data storage, and its compact size is suitable for space limited devices. With UNO-3074, PCI cards are easy to install and operate, and with their plug & play feature, they are easy to maintain and remove when necessary. By adopting the UNO-3074 with Advantech's PCI cards, a total solution for monitoring and maintaining consistent tension for the cable pulley system was achieved.

System Diagram



Self-Service Car Wash

Machine Automation

Taiwan

Project Introduction:

With rising wages and 24/7 service expectations, a leading chain of gas stations in Taiwan decided to create a self-service car wash. This required that the system was fully integrated with payment systems such as credit cards, cash cards, Modex, stored value cards and membership cards. With the UNO-2170 and FPM-3150, the application has been successful, and the customer is already busy developing new features.

System Requirements:

The Self-Service wash car system had to be connected to a wide range of equipment like: card readers, bar code scanners, cash registers and central servers. The customer desired to build a reliable automation system that could withstand high temperatures and resist spilled water from the washing machine. Connected to an Ethernet network, the system would communicate with a host system and banks for transactions. And with an outdoor installation in sunny Taiwan, it was necessary to have an operator interface with high brightness so that it was visible in strong sunlight.

System Description:

The first attempt failed because I/O port limitations made expansion impossible. UNO-2170 solved that problem, and is now the core platform in the system. All payment systems and readers such as the cash register, membership card reader, and credit card reader, can connect to UNO-2170 by RS-232. When an operator pays, UNO-2170 can start the PLC that controls the car wash. All records are temporarily stored in UNO-2170 and periodically passed to the gas station's host system. Through the local Ethernet network, all records can be exchanged between the central control room and gas station's host system.

The car wash had to connect with the POS server in the gas station, and Advantech products were also applied here. IPC-610 was used for the chassis, while PCA-6180 was used for the CPU card. IPC-610 is a 19" rack mounted industrial computer chassis for mission-critical applications. This unit can accommodate a 14-slot PCI/ISA bus passive backplane or a standard ATX motherboard and supports versatile power supplies. A lockable door in the front secures the unit from any unauthorized access. One hot-swap filtered cooling fan maintains positive air circulation through the whole chassis. IPC-610 can withstand shock, vibration and dust.

In the first phase of this project, customers pay and get a code from the cashier in the gas station. This code is then input on the FPM-3150 touch screen, which starts the car wash program. But since this requires interaction with a cashier, it is not 100% unmanned. With the first phase already running successfully, the second phase will be to create unmanned payment facilities at the car wash. This means using the remaining COM ports of UNO-2170 to link with a credit card reader, the cash register, membership card reader, prepaid card reader and receipt printer. There will also be a sensor to detect, greet and get visitors quickly started with their car wash.

Project Implementation:

UNO-2170
Celeron M 1 GHz Embedded Automation Computer with PC/104 Expansion

FPM-3150
Industrial Flat Panel Monitor with 15" LCD in Direct-VGA Port

IPC-610 with PCA-6180 SBC
19" Rackmounted Industrial Computer Chassis with Front-accessible Fan

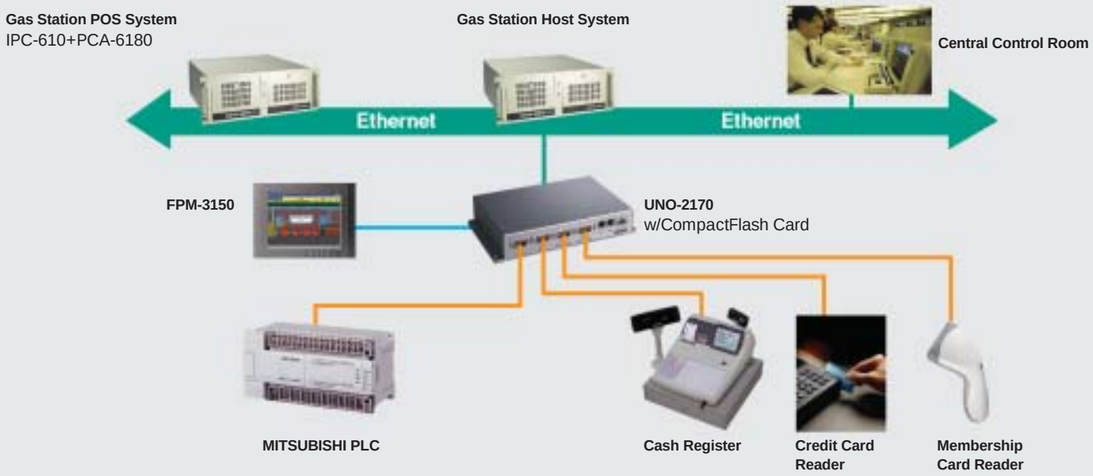
Mitsubishi PLC

Conclusion:

As a controller, UNO-2170 quickly proved to be a smart choice. The high temperature tolerance meant that an outdoor application would be no problem, and the compact size facilitated installation in the same enclosure as the display. Vibration-resistant storage ensured that the operating system could run reliably. And UNO-2170's flexible expansion options provided enough ports for all the planned device connections from PLCs, bar code readers, and a broad selection of payment systems.

With Visual Basic programs in Windows XP on a CompactFlash disk, the system is easily updated. Not using a proprietary language means program development is easier, and upgrading of the OS in the field is simply a matter of replacing the CompactFlash disk. For program updates, it is possible to connect with UNO-2170 through the Internet and upload the changes. Downtime is not an issue.

System Diagram



Metal Injection Molding Process

Machine Automation

USA

Project Introduction:

Metal injection molding is a relatively new process that takes advantage of several key technologies to produce molded metal parts of various properties. Although driven by the latest technologies in Industrial Automation, the molding process is very delicate, and if any small pieces are left in the cavity after a part has been ejected, the mold can be severely damaged during the next cycle. Therefore, our client was looking to develop an automatic inspection system to monitor the molding process, and prevent severe damage. Advantech's UNO-2171 was chosen as the control platform for the vision protection system, due to its Pentium M-grade CPU, fanless architecture, rich I/O support, its USB 2.0, VGA, and LAN ports, and its overall superior industrial design.

System Requirements:

During the injection molding process, high tempered steel molds are used to form parts into an uncured (green) state. In some cases, multi-cavity molds for small, very complex orthodontic parts were being damaged by materials which remain in the mold cavities after ejection. Traditionally, the only way to make sure the cavities are always clear was to have the operator manually check the cavity after each mold has been ejected. However, this is a very time consuming and strenuous process for the operator, which frequently resulted in human error. Not only would the mold and cavities be damaged, but operators were at risk due to the heated ovens and dangerous machinery. Thus, our customer was eager to find an automatic mold protection system to prevent damage to their equipment, moldings, and operators.

Advantech's UNO-2171 was chosen as the control platform of the vision protection system. Monitoring cameras are connected via 2 x USB 2.0 ports, providing VGA output for any 1024 x 768 display. Additionally, the LAN port was accessed for remote setup, viewing & monitoring. In this fashion, two inspections occur, once before ejection and once after. This complicated inspection process requires high computing power which the PC-based UNO-2171 (with Pentium M up to 1.4GHz) meets and exceeds. Moreover, UNO-2171's industrial features, including its wide operating temperature (-10 ~ 60°C), and anti-vibration and anti-shock features makes the perfect choice for harsh environments. Furthermore, with its compact size (255 x 152 x 59 mm), the UNO-2171 can be mounted easily in any space-constrained environment.

System Description:

The UNO-2171 is a Pentium M 1.4 GHz Embedded Automation Computer with PC/104 Expansion, and the ADAM-6060 is an Ethernet-based 6-ch Isolated Digital Input and 6-ch Relay Output module. The automatic inspection system was designed to integrate UNO-2171, ADAM-6060 and a USB 2.0 CCD camera together. The UNO-2171 is integrated with ADAM-6060 through Ethernet port, and integrated with USB camera through USB 2.0 port.

When the mold is open, the limit switch connected to ADAM-6060 will trigger the camera to take a picture. After image comparison, the ADAM-6060 relay output will send a notice to the injection machine controller if there is anything inside the mold. After mold ejection, another sensor connected to ADAM-6060 will trigger the camera to take another picture. After image comparison, the ADAM-6060 relay output will send a notice to the injection machine controller if there are any foreign pieces inside the mold.

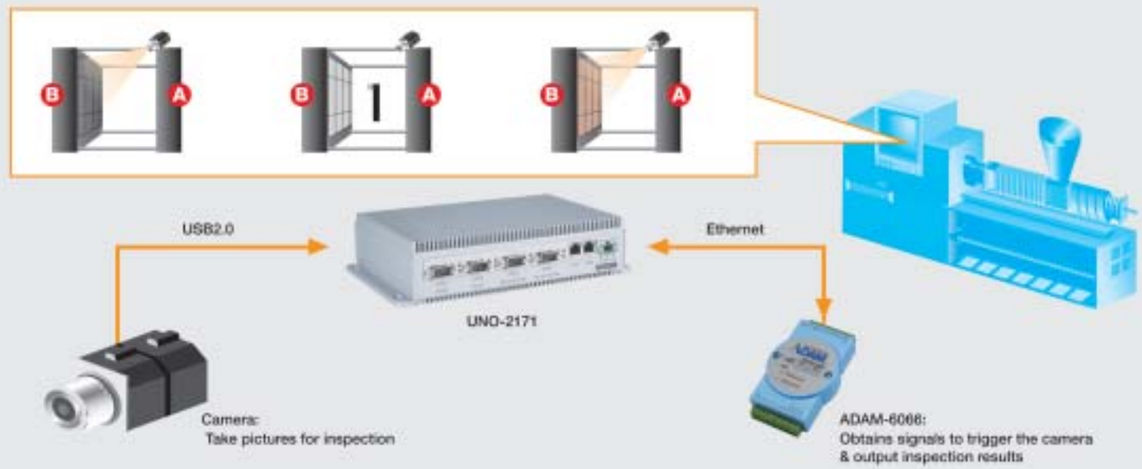
Project Implementation:

UNO-2171
Pentium M 1.4 GHz UNO with
PC/104+ Expansion, 2 x USB 2.0

Conclusion:

The combination of Advantech's hardware, software, and optical technologies in one product offering provides an extremely robust, reliable, and affordable technology that can be easily used by non-technical operators. Advantech's UNO-2171 ensures hi-speed inspections (up to 60 per second), while maintaining 100% accuracy. Our customers not only saves time and labor costs, but also prevents severe damage, and avoids unnecessary down-time, which can often be more expensive and troubling than the mold damage itself.

System Diagram



Mobile License Plate Recognition System

Intelligent Tranportation

Taiwan

Project Introduction:

Because of its reliable design and excellent vibration resistance, UNO-2170 was chosen for a mobile License Plate Recognition (LPR) system in Taiwan. Police cars were equipped with the License Plate Recognition system to process observed license plate numbers through a central database of stolen cars at the headquarters.

The system makes use of ADAM-4055 for power management, and is equipped with a Global Positioning System (GPS) module, add-on video input, real-time Optical Character Recognition (OCR) software and wireless connectivity via GPRS/CDMA/WLAN.

System Requirements:

- A rugged and compact platform to endure wide temperature ranges
- Anti-vibration and anti-shock design for reliable performance in a vibrating and moving environment
- Power management for safe shutdown of system
- Video input capacity for license plate number capture through PC/104 interface
- Efficient OS for quick start and stop of system and compatibility with OCR software
- GPS/GPRS/CDMA wireless connectivity for mobile usage

System Description:

When the police car starts/stops the engine, ADAM-4055 ensures that the system is activated/deactivated. A camera is mounted in the front of the car, controlled by the driver. With a video capture card in its PC/104 extension slot, UNO-2170 can receive image data from the camera. This image data is then processed by the OCR software to filter a license plate number out from the captured image. The number is passed to the central database at the headquarters by GPRS/GPS or WLAN, where it is used for a query into a database for stolen cars. The query returns detailed information to the police car and displays it on an LCD monitor for the police officer.

Project Implementation:

UNO-2170
Celeron M 1 GHz Embedded Automation Computer with PC/104 Expansion

ADAM-4055
16-ch Isolated Digital I/O Module with LED & Modbus

Conclusion:

- Equipped with an Intel Celeron 1 GHz CPU and 2.5" HDD, UNO-2170 is a powerful industrial-grade computer that can handle large amounts of data. UNO-2170 has passed a 1 G random vibration test with a HDD inside, so the system could use Windows 2000 for the OCR software to run on
- UNO-2170 is equipped with a PCMCIA slot and PC/104 extension kit that can be used for wireless data dispatches and camera capture cards. So all license plates can be captured and dispatched through a wireless network to the command center for identification
- By adding an ADAM-4055 module, a solid power management system could also be created to perform safe shutdowns
- USB and COM ports on UNO-2170 make expansions and future device connections easier

System Diagram